



# Norway's full scale integrated CCS project

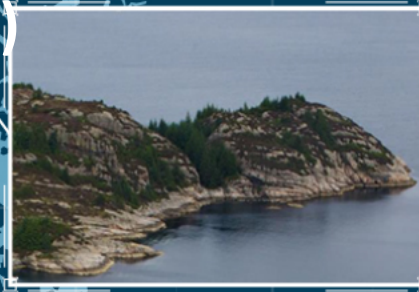
**Bjørn-Erik Haugan**  
Gassnova

# Equinor, Total and Shell ("Northern Lights")

CO<sub>2</sub> transport and storage in the North Sea



- Onshore terminal
- 110 km pipeline,
- One injection well



**Fortum Oslo Varme AS**  
Waste-to-energy plant



**Norcem AS, Brevik**  
Cement plant



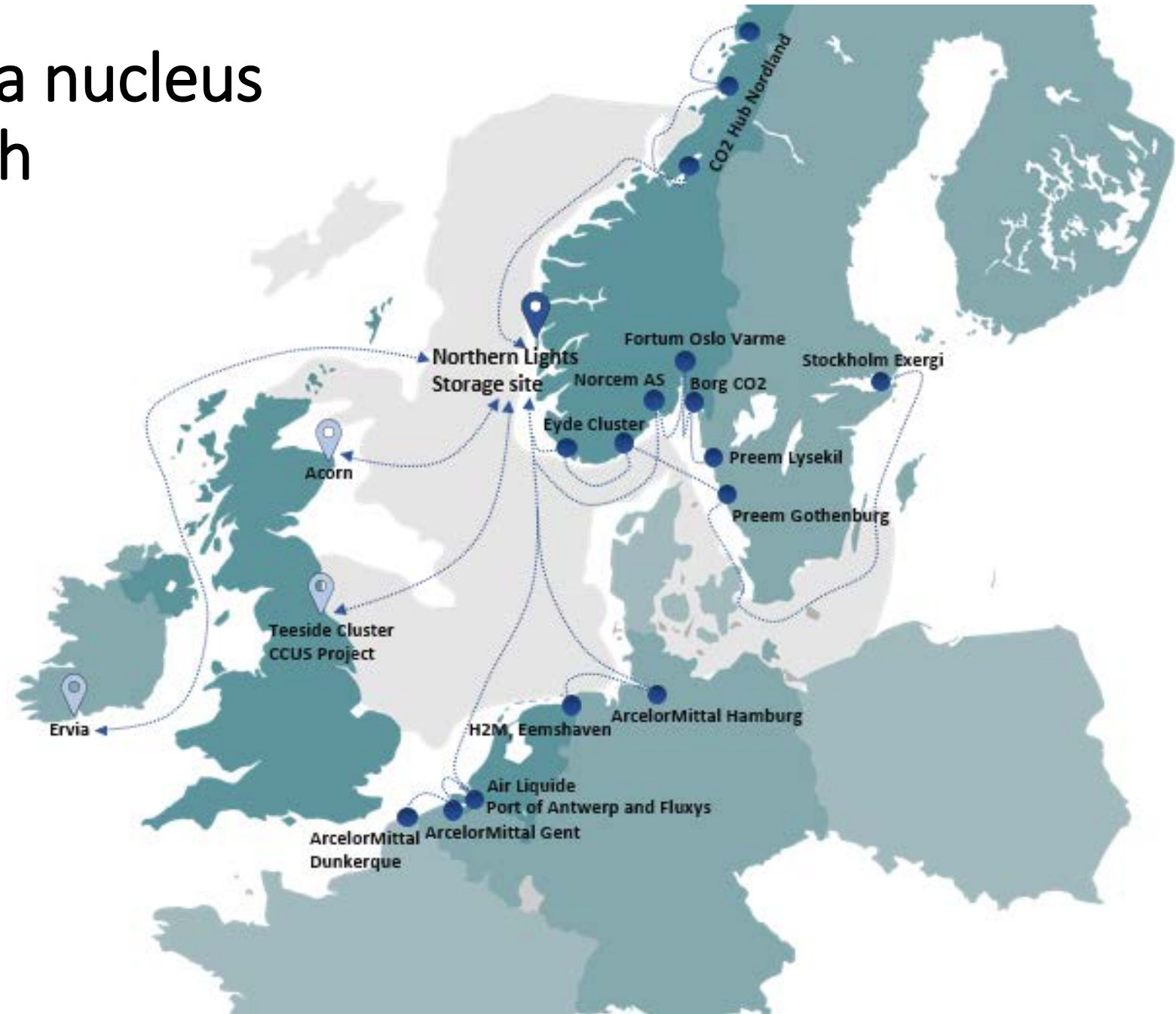
- Capture 400 kt/y each
- Amine technology



- Transport by ship
- 700 km
- Liquid (15 barg, -26°C)



# Northern Lights: a nucleus for further growth



Kilde: PCI-søknad fra Northern Lights (Equinor, Shell og Total)

# FORTUM OSLO VARME, KLEMETS SRUD



- Waste-to-energy facility
- Capture 400,000 T CO<sub>2</sub>/year (90%)
- 60% biogenic CO<sub>2</sub>, a carbon negative project
- CCS from waste-to-energy can remove > 90 MT of CO<sub>2</sub>/ year from existing plants in Europe
- Amine Technology (Shell Cansolv)

# NORCEM, BREVIK



- Norcem is part of HeidelbergCement, which has about 60 cement factories in Europe
- Capture 400,000 T CO<sub>2</sub>/year (50%)
- CO<sub>2</sub> will be captured by using excess heat from the production of cement
- Amine technology (Aker)

# Drivers

Government	<p>CCS a key govt Climate initiative</p> <p>Project building on 20ys of RD&amp;D, Sleipner, Snøhvit, Equinor</p> <p>NS very large storage capacity</p> <p>Gassnova, Climit, TCM</p>	<p>Pan European Project of international relevance and involvement</p> <p>Gross 1-1,5bn EUR</p> <p>Defined project period</p> <p>Operation 2023/24</p>	<p>DEMO for</p> <ul style="list-style-type: none"><li>• Technology,</li><li>• bsns framework</li><li>• Regulation</li><li>• Safety of CCS</li></ul>

## EUA Price



Zoom 1m 3m 6m YTD 1y **All**

From Apr 7, 2008 To Aug 19, 2019

